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US 5899491 A

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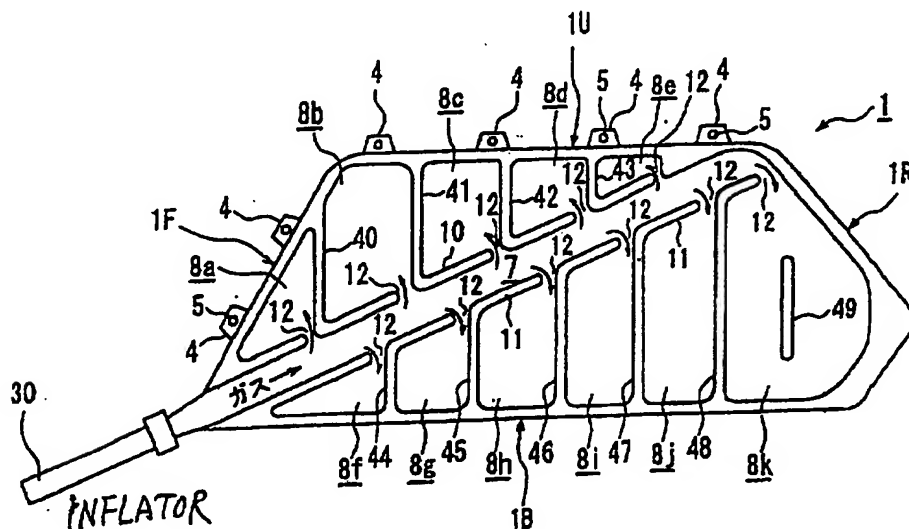
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(54) Abstract Title

**A protective bag for the head of a vehicle occupant**

(57) A bag (1) is formed by overlaying a sheet (2) on a sheet (3) so that a main gas passage (7) and small chambers (8a to 8k) are formed between both the sheets (2) and (3) by connecting peripheral portions thereof. The main gas passage (7) extends from the lower end of a front-side portion (1F) of the bag (1) to the rear end of an upper-side portion (1U). First, gas from an inflator (30) inflates the main gas passage (7) in the shape of a linear bar so that bag (1) is spread like a curtain. Then the gas flows into the small chambers (8a to 8k) from the main gas passage (7) via gas inlets (12) to inflate each of the small chambers (8a to 8k).

Fig. 4



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Fig. 1

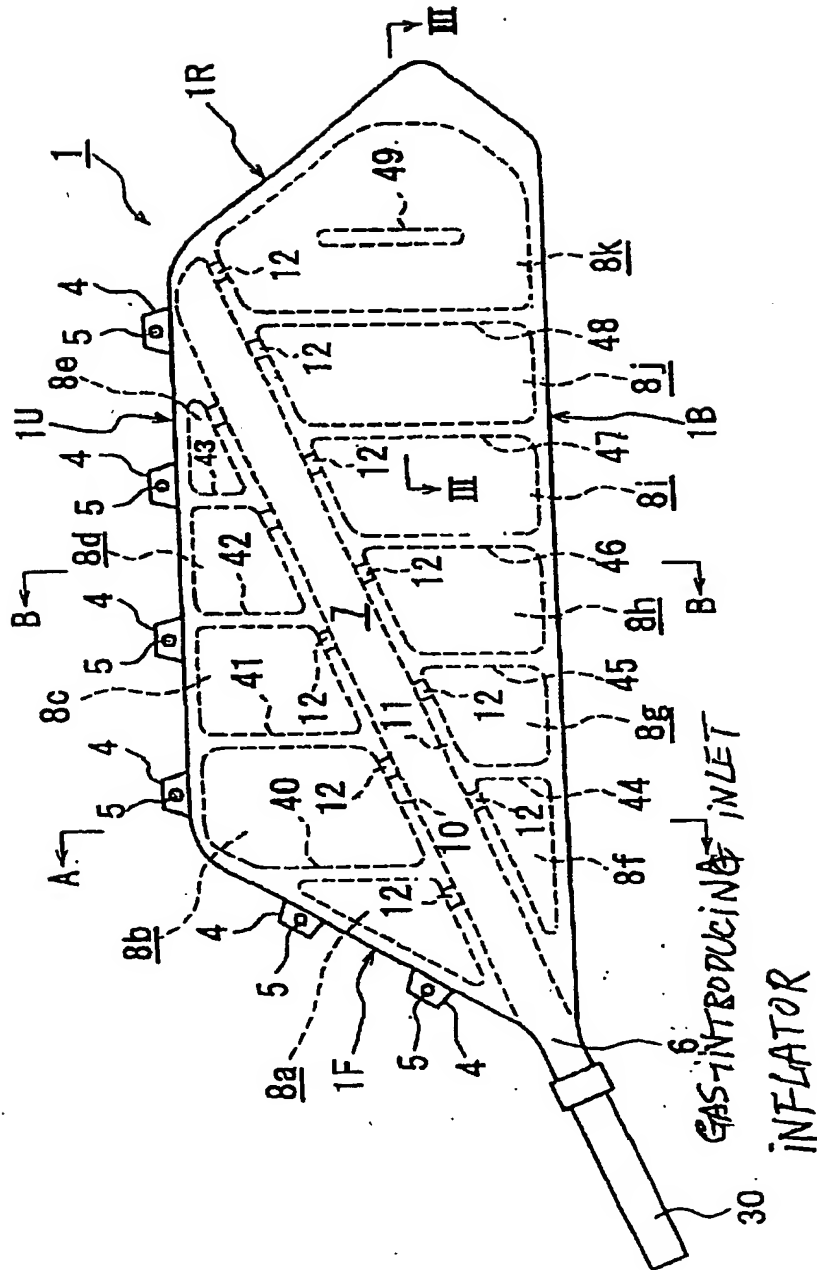


Fig. 2

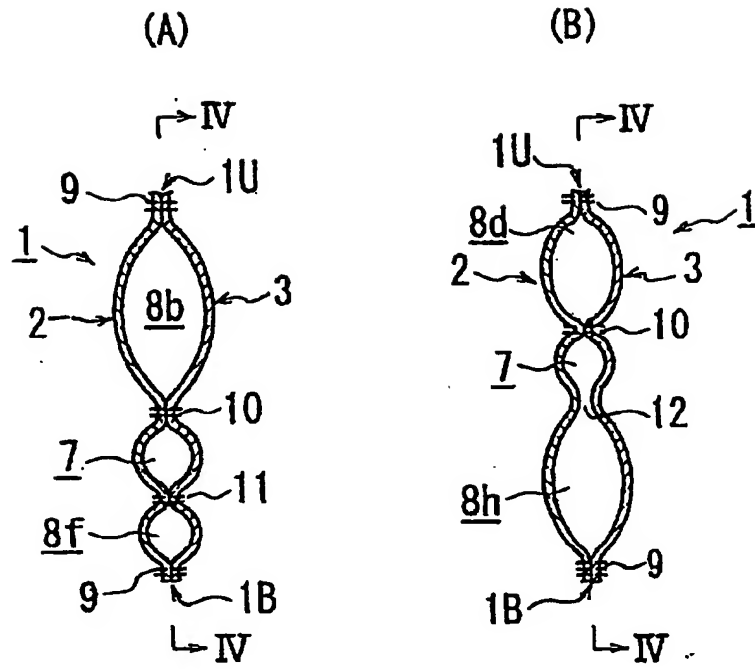


Fig. 3

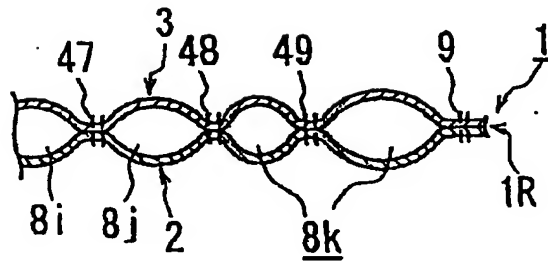


Fig. 4

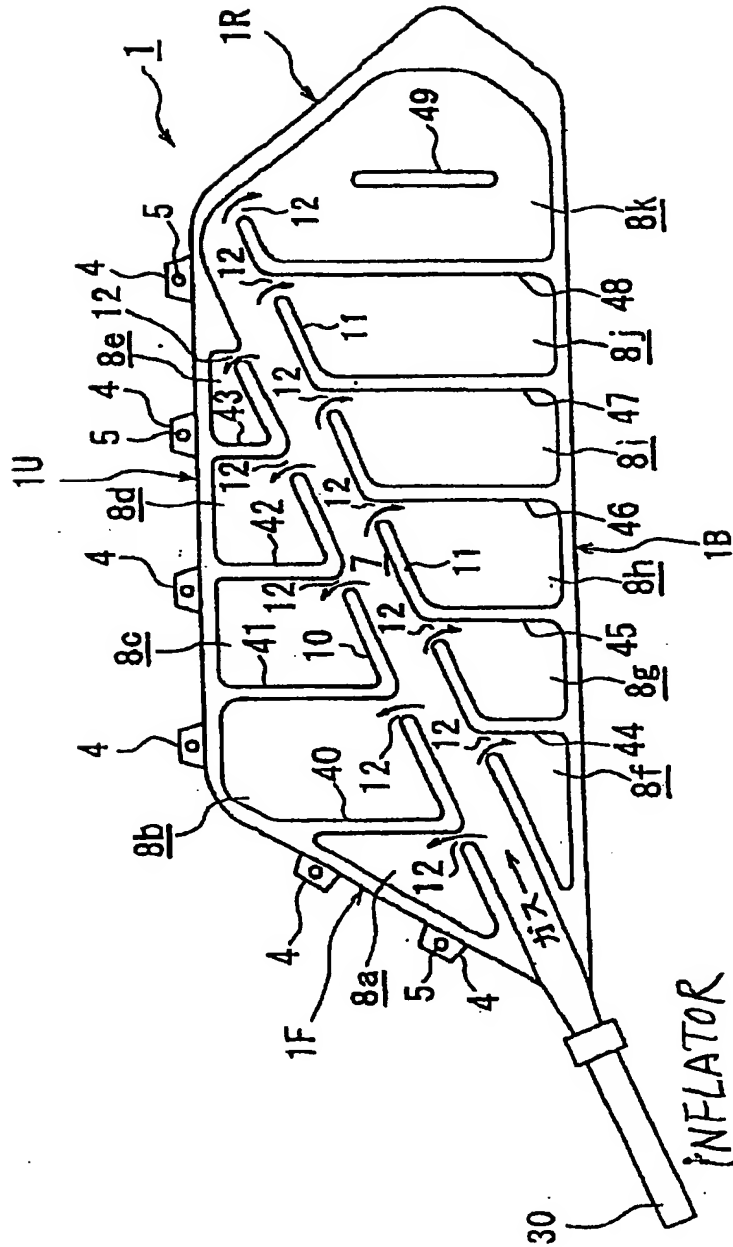


Fig. 5

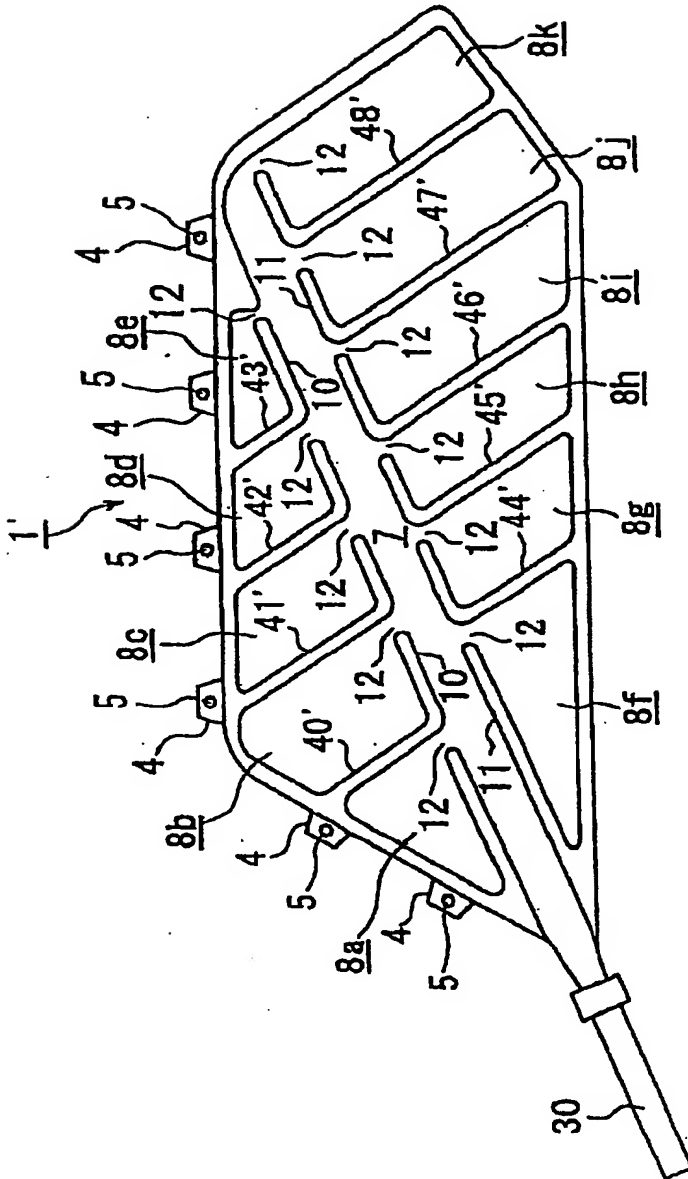
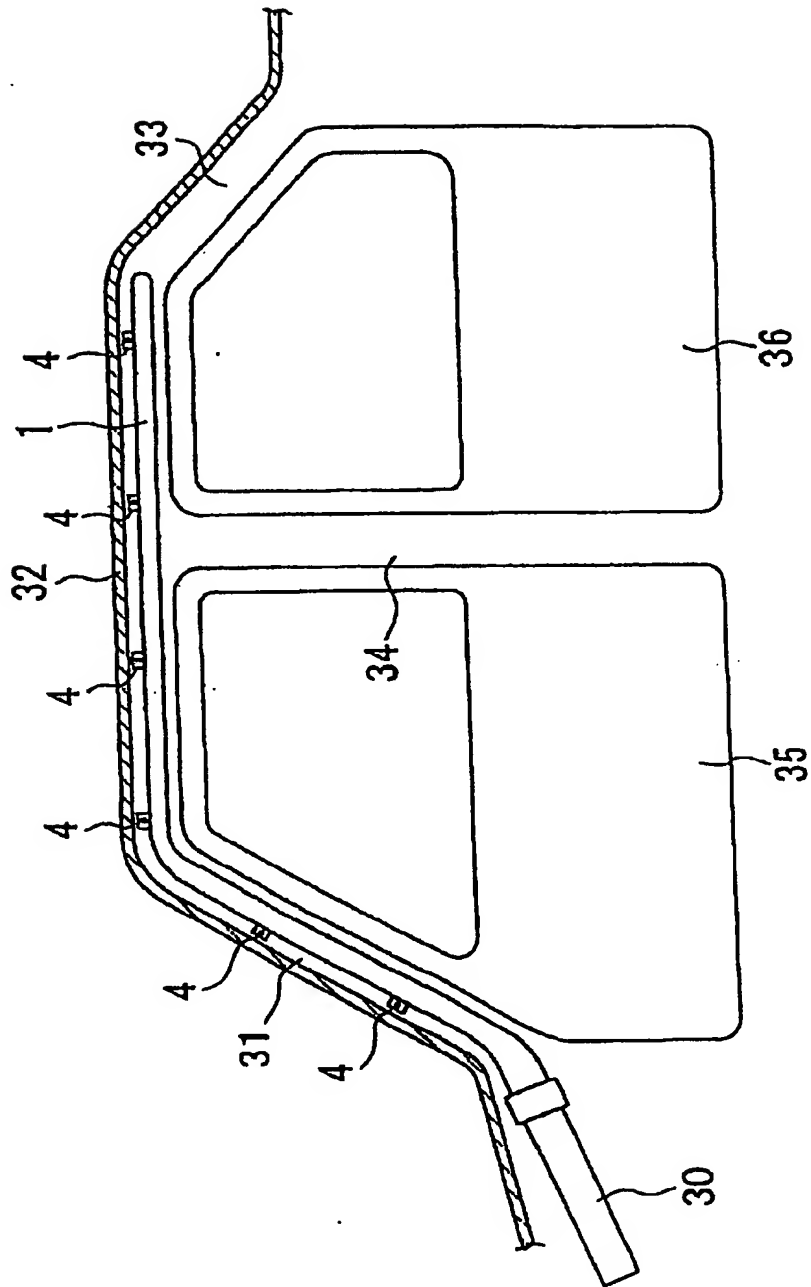


Fig. 6



PROTECTIVE BAG FOR HEAD OF AUTOMOBILE OCCUPANT, PROTECTOR,  
AND AUTOMOBILE

The present invention relates to a protective bag for the head of an automobile occupant, specifically to an inflatable bag inflating along a side-door window, etc., in a side-on collision, a sideways rolling, or the like, and more specifically, it relates to a protective bag for the head of an automobile occupant of the type that gas is introduced from a gas-introducing inlet into a main gas passage to be distributed to a plurality of small chambers therefrom. The present invention also relates to a protector for the head of an occupant of an automobile having the protective bag and to an automobile having the protector.

This type of protective bag for the head of an automobile occupant is disclosed in WO96/26087 and particularly shown in Figs. 1 and 9 of the Publication. The inside of this known bag comprises a duct portion (main gas passage) extending from one end of the bag in the front side of an automobile (the front end) to the other end thereof in the rear side of the automobile (the rear end) along the upper edge of the bag and numerous cell portions (small chambers) connecting to the duct portion to extend downwardly.

In the bag disclosed in WO96/26087, gas enters the inside of the duct portion from the duct portion in the rear

side of the automobile to inflate cell portions sequentially from the rear side of the automobile, so that cell portions in the front side inflate considerably lagging behind cell portions in the rear side.

It is an object of the present invention to provide a protective bag for the head of an automobile occupant rapidly inflatable as a whole having the small time difference in inflating each part of the bag, a protector equipped with the bag, and an automobile equipped with the bag.

A protective bag for the head of an automobile occupant according to the present invention arranged in the vicinity of the intersecting corner of a ceiling portion and a lateral face of the cabin of an automobile and which is inflatable downwardly by gas introduced from a gas-introducing inlet along the lateral face, the protective bag comprises: a lateral-side portion arranged along a pillar of the automobile; an upper-side portion arranged along the ceiling portion; a main gas passage disposed within the bag and connected to the gas-introducing inlet; and a plurality of small chambers disposed within the bag, each having gas introduced therein from the main gas passage, wherein the gas-introducing inlet is arranged in the lower portion of the lateral-side portion and the main gas passage extends diagonally from the lower portion of the lateral-side portion to the upper portion.



In such a protective bag for the head of an automobile occupant, when gas is introduced into the main gas passage from the gas-introducing inlet, the gas firstly inflates the main gas passage. When the main gas passage inflates, the main gas passage of the bag stretches diagonally in the shape of a bar from the lower portion of a pillar of an automobile such as an A-pillar to the upper portion just like a stem inserted into a sail. Thereby, the most part of the bag is spread like a curtain along a side door, etc. Then the gas is introduced into each of small chambers from the main gas passage to inflate each of the small chambers. When the small chambers inflate, since the bag itself has been spread, each small chamber simply increases only in the thickness thereof. That is, the gas introduced into the small chamber scarcely spread the folded bag, so that introduction resistance received by the gas is extremely small.

Therefore, each small chamber inflates extremely smoothly so that the whole bag is completely inflated in a fairly short time.

According to the present invention, it is preferable that the main gas passage be linear. According to the present invention, the gas-introducing inlet may be preferably arranged in the lower portion of the bag front-side portion along an A-pillar.

According to the present invention, the bag may have a

rear-side portion arranged along a C-pillar. In this case, it is preferable that the main gas passage extend from the lower portion of the front-side portion toward the vicinity of the intersecting corner of the upper-side portion and the rear-side portion.

According to the present invention, it is preferable that the small chambers be arranged at each of the upper and lower sides of the main gas passage.

A protector for the head of an automobile occupant according to the present invention comprises the protective bag and an inflator connected to the gas-introducing inlet of the protective bag. An automobile according to the present invention comprises the protector.

Embodiments will be described with reference to the accompanying drawings:

Fig. 1 shows a front view of a protective bag for the head of an automobile occupant according to a first embodiment of the present invention;

Fig. 2 shows sectional views at the lines A-A and B-B of Fig. 1;

Fig. 3 shows a sectional view at the line III-III of Fig. 1;

Fig. 4 shows a sectional view at the line IV-IV of Fig. 2;

Fig. 5 shows a structural view of a protective bag for the head of an automobile occupant according to a second embodiment; and

Fig. 6 shows a side view of the inside of an automobile having the protective bag according to the embodiments equipped therein.

The protective bag 1 according to the first embodiment is formed by overlaying a sheet in the cabin side 2 on a sheet in the window side 3 to connect them together linearly so that a main gas passage 7 and small chambers 8a to 8k are formed between both the sheets 2 and 3. Numeral 4 denotes a protruding piece for attaching the bag 1 to a roof side member 32 and an A-pillar of an automobile while numeral 5 represents a through-hole for a locking fixture such as a rivet formed in the protruding piece 4. Numerals 33, 34, 35, and 36 denote a C-pillar, a B-pillar, a front door, and a rear door, respectively.

The main gas passage 7 extends from the lower end of a front-side portion 1F along the A-pillar to the rear end of an upper-side portion 1U and is provided with a gas-introducing inlet 6 at the front end to be connected to an inflator 30.

These sheets 2 and 3 are connected together by a linear connecting portion 9, a pair of diagonal linear connecting portions 10 and 11 in parallel to each other, and vertical linear connecting portions 40 to 49. The connection may be performed by any one of suture, adhesion, and deposition.

The diagonal linear connecting portions 10 and 11 are

for forming the main gas passage 7. The linear connecting portion 10 extends from the lower portion of the front-side portion 1F of the bag 1 to the rear end of the upper-side portion 1U while the linear connecting portion 11 extends from the front end of a lower side portion 1B of the bag 1 to the upper end of a rear-side portion 1R. The diagonal linear connecting portions 10 and 11 are provided with gas inlets 12 for introducing gas from the main gas passage 7 to the small chambers 8a to 8k.

The vertical linear connecting portions 40 to 43 are extended from the diagonal linear connecting portion 10 upwardly to reach a peripheral linear connecting portion 9. The vertical linear connecting portions 44 to 48 are extended from the diagonal linear connecting portion 11 downwardly to reach the peripheral linear connecting portion 9. The vertical linear connecting portion 49 extends vertically inside the small chamber 8k. The vertical linear connecting portion 49 is for preventing the small chamber 8k from excessively inflating in the thickness direction.

The front part of the bag 1 is set up to an automobile in a folded state along an A-pillar 31 of the automobile while the middle and the rear part are set up thereto in a folded state along a roof-side rail 32.

The folded bag 1 is covered by a cover (not shown). The cover is formed to be torn when the bag 1 inflates.

In a side-on collision or a sideways rolling of an automobile, the inflator 30 is operated to send gas from the gas-introducing inlet 6 to the main gas passage 7, which in turn flows into each of the small chambers 8a to 8k to inflate them.

Since gas from the gas-introducing inlet 6 firstly inflates the main gas passage 7 in the shape of a linear bar, the bag 1 is spread along the upper parts of the doors 35 and 36 like a curtain. Then the small chambers 8a to 8k are inflated so as to increase the thickness of the bag 1. Since gas is supplied to each of the small chambers 8a to 8k substantially at the same time after spreading of the bag 1 in this manner, both the front and rear sides of the bag 1 inflate substantially at the same time. Each of the small chambers 8a to 8k inflates extremely rapidly because gas is introduced thereinto after the bag 1 is spread in the shape of a curtain.

Fig. 5 is a front view of a protective bag 1' according to a second embodiment showing the structure of the same part as that in Fig. 4.

In Fig. 5, vertical linear connecting portions 40' to 43' are diagonally extended to the forward portion from the linear connecting portion 10 while vertical linear connecting portions 44' to 48' are diagonally extended to the downward portion from the linear connecting portion 11. In addition, the vertical linear connecting portion 49 is

not provided therein.

The other structure of the bag 1' shown in Fig. 5 is the same as that of the bag 1 shown in Figs. 1 to 4, wherein like reference characters designate like common portions. The bag 1' is also inflatable extremely rapidly like the bag 1 shown in Figs. 1 to 4.

In the above-mentioned embodiments, the rear-side portion 1R is arranged along the C-pillar; however the rear-side portion 1R may be arranged along the B-pillar or a D-pillar.

Also, according to the present invention, the gas-introducing inlet and the inflator may be arranged in the rear side of an automobile, in the C-pillar for example, so that the main gas passage may extend from the lower end of the bag rear-side to the front end of the bag upper-side or to the upper end of the front-side.

As described above, a protective bag for the head of an automobile occupant according to the present invention can be inflatable more rapidly compared with conventional one. Thereby, an inflator having a smaller capacity can be utilized.

## Claims

1. A protective bag for the head of an automobile occupant which is arranged in the vicinity of the intersecting corner of a ceiling portion and a lateral face of the cabin of an automobile and which is inflatable downwardly by gas introduced from a gas-introducing inlet along the lateral face, said protective bag comprising:

    a lateral-side portion arranged along a pillar of the automobile;

    an upper-side portion arranged along the ceiling portion;

    a main gas passage disposed within the bag and connected to the gas-introducing inlet; and

    a plurality of small chambers disposed within the bag, each having gas introduced therein from said main gas passage,

    wherein the gas-introducing inlet is arranged in the lower portion of said lateral-side portion and said main gas passage extends diagonally from the lower portion of said lateral-side portion to the upper portion.

2. A protective bag according to Claim 1, wherein said main gas passage extends linearly.

3. A protective bag according to any one of Claims 1 and 2, wherein the pillar is an A-pillar and said lateral-side portion is a front-side portion.

4. A protective bag according to Claim 3 further comprising a rear-side portion arranged along a C-pillar.

5. A protective bag according to Claim 4 wherein said main gas passage extends toward the vicinity of the intersecting corner of said upper-side portion and said rear-side portion.

6. A protective bag according to any one of Claims 1 to 5, wherein said plurality of small chambers are arranged at each of the upper and lower sides of said main gas passage.

7. A protector for the head of an automobile occupant comprising:

    a protective bag according to any one of Claims 1 to 6;  
and

    an inflator connected to the gas-introducing inlet of said protective bag.

8. An automobile comprising a protector for the head of an automobile occupant according to Claim 7.

9. A protective bag substantially as shown and/or described with reference to any of Figures 1 to 6 of the accompanying drawings.





**Application No:** GB 0017412.8  
**Claims searched:** 1-9

**Examiner:** Kevin Hewitt  
**Date of search:** 2 October 2000

## **Patents Act 1977**

### **Search Report under Section 17**

#### **Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B7B (BSBCC, BSBCE)

Int Cl (Ed.7): B60R 21/16, 21/20

Other: Online WPI, EPODOC, JAPIO

#### **Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
Y,E	GB 2339557 A (AUTOLIV) See Figs 2 and 4	1,2,4,5,7
Y :	EP 0899171 A1 (TOYODA) See Figs 4 and 5	1-7
Y	EP 0798173 A1 (TRW) See Fig.1	1-3,6,7
Y	WO 97/43146 A1 (AUTOLIV) See Figs 1 and 4	1-3,5-7
Y	US 5899491 A (TSCHAESCHKE) See Fig.1	1,2,4,6,7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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